BT-MRE-I&II-05.18-1019 Reg. No. [ ] **B**

B.Tech. Degree I & II Semester Examination in Marine Engineering May 2018

MRE 1102 ENGINEERING MATHEMATICS II
(2013 Scheme)

Time: 3 Hours Maximum Marks: 100

(5 × 20 = 100)

I. (a) State Cayley Hamilton theorem and hence verify $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. (5)

(b) Find the eigen values and eigen vectors of $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$. (10)

(c) Reduce the quadratic form to the canonical form $3x^2+5y^2+3z^2-2yz+2zx-2xy$. (5)

OR

II. State and prove the necessary and sufficient conditions for a function to be analytic. (20)

III. (a) Solve $\dfrac{dy}{dx}=\sin(x+y)+\cos(x+y)$. (10)

(b) Solve $(x+1)\dfrac{dy}{dx}-y=e^{3x}(x+1)^2$ (10)

OR

IV. (a) Solve $\dfrac{d^4x}{dt^4}+4x=0$. (5)

(b) Solve $\dfrac{d^2y}{dx^2}-4y=x\sin hx$. (5)

(c) Solve $\dfrac{d^2y}{dx^2}-4\dfrac{dy}{dx}+4y=8\left(x^2+e^{2x}+\sin 2x\right)$. (10)

V. (a) Find the fourier series to represent $f(x)=x^2$ in the interval $(-1,1)$. (10)

(b) Obtain fourier series for the function $f(x)$ given by $f(x)=2x-x^2$ in $(0,3)$. (10)

Deduce that $\dfrac{1}{1^2}-\dfrac{1}{2^2}+\dfrac{1}{3^2}-\dfrac{1}{4^2}+\ldots=\dfrac{\pi}{12}$.

OR

VI. (a) Find the half range cosine series for $x\sin x$ in $0<x<\pi$. (10)

(b) Prove that $\beta(p,q)=\int_0^1\dfrac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}dx$. (10)

(P.T.O.)

VII. (a) Find the laplace transform of (i) $\sin 2t \sin 3t$ (ii) $\sqrt{t}\, e^{3t}$ (iii) $\left(1-e^{t}\right)/t$. (10)

(b) Derive the laplace transform of periodic function. (10)

OR

VIII. (a) Solve by the method of transforms (10)

$y'' - 3y' + 2y = 4t + e^{3t}$, $y(0) = 1$, $y'(0) = -1$.

(b) Find the inverse transform of (i) $\frac{s^2 - 3s + 4}{s^3}$ (ii) $\frac{s+2}{s^2 - 4s + 13}$. (10)

IX. (a) State Baye's theorem. There are three bags: first containing 1 white, 2 red, 3 green balls; second 2 white, 3 red, 1 green balls and third 3 white, 1 red, 2 green balls. Two balls are drawn from a bag chosen at random. These are found to be one white and one red. Find the probability that the balls so drawn came from the second bag. (10)

(b) A variate X has the probability distribution (10)

X	:	-3	6	9
P(X = x)	:	1/6	1/2	1/3

Find E(X) and E (X^2). Hence evaluate E $[(2X+1)^2]$.

OR

X. (a) If the probability of a bad reaction from certain injection is 0.001. Determine the chance that out of 2000 individuals more than two will get a bad reaction. (10)

(b) For the normally distributed variate X with mean 30 and SD 5 find the probability that (i) $26 \le X \le 40$ (ii) $X \ge 45$. (10)

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